## REMARKS

Claims 1 through 9 are currently pending in the application.

This Amendment is in response to the Final Office Action dated December 4, 2002 and the Advisory Action dated March 5, 2003. Please note that no amendments to the claims have been submitted with this Amendment under 37 C.F.R. §1.116.

Claim 2 was rejected under 35 U.S.C. § 112, first paragraph.

Claims 1 through 3 and 6 through 9 were rejected under 35 U.S.C. § 103 as being unpatentable over Watts, Jr. et al. (U.S. Patent 6,276,589 B1, hereinafter "Watts").

Claims 4 and 5 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Watts as applied to claim 3 above, and further in view of Nakasu et al. (U.S. Patent 6,213,356 B1, hereinafter "Nakasu").

Applicants respectfully request reconsideration of the above-referenced application.

### 35 U.S.C. § 112 Claim Rejection

Claim 2 was rejected under 35 U.S.C. § 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor, at the time the application was filed, had possession of the claimed invention. The Examiner indicates that the limitation of controlling the temperature of the ejected solder is not taught by the specification.

Applicants respectfully submit that the as-filed specification of the above-referenced application clearly describes the process of controlling the droplet temperature by controlling the temperature of the liquid solder metal in the reservoir. Besides the temperature controller illustrated in FIG. 1 of the above-referenced application, consider, the disclosure of paragraph **[0015]**, which reads:

> "The droplets 14 are formed from melted metal held in liquid metal reservoir 16. A temperature controller 18 is connected to reservoir 16 so that the temperature of the liquid metal held in the reservoir can be kept at a desired temperature that leads to optimum droplet formation and release. For example, the solder eutectic temperature at the point of release is 190 °C and its temperature at impact is 183 °C. To prevent droplets 14 from cooling too rapidly or from oxidizing, a constant surrounding temperature is provided and, if desired, the

apparatus can be placed in a container that is either under vacuum or is filled with an inert gas" (as-filed specification, paragraph **[0015]**, emphasis added).

Applicants respectfully submit that the as-filed specification of the above-referenced application clearly describes the process of controlling the droplet temperature and request that the rejection of claim 2 under 35 U.S.C. §112, first paragraph be withdrawn. In any event claims 1 and 2 have been amended to clearly reflect the specification. Therefore, claim 2 is allowable as it clearly complies with 35 U.S.C. § 112.

**35 U.S.C. § 103(a) Rejections**

**(A) Applicable Authority**

Applicant submits that the basic requirements of a *prima facie* case of obviousness are summarized in MPEP §2143 through §2143.03, *i.e.*, in order "to establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine the reference teachings. Second, there must be a reasonable expectation of success in combining the references. Third, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the expectation of success must both be found in the prior art, and not based on Applicants' disclosure." *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). Further, in establishing a *prima facie* case of obviousness the initial burden is placed on the examiner. "To support the conclusion that the claimed invention is directed to obvious subject matter, either the references must expressly or impliedly suggest the claimed invention or the examiner must present a convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings of the references." *Ex parte Clapp*, 227 USPQ 972, 973 (Bd. Pat. App. & Inter. 1985). See also MPEP § 706.02(j) and § 2142.

**(B) Obviousness rejections in view of Watts**

Claims 1 through 3 and 6 through 9 were rejected under 35 U.S.C. § 103 as being unpatentable over Watts. Applicants respectfully submit that Watts does not make obvious the invention recited in the independent claim 1 of the above-referenced application. In summary, Applicants respectfully submit that the requirements of a *prima facie* case of obviousness and its associated burden was not met by the Office Action of June 13, 2002 nor in the Final Office Action of December 4, 2002. It is Applicant's position that such a conclusion is based primarily on the fact that the assertion the cited prior art references teach or suggest the limitations of the recited claims is based on the benefit of hindsight based solely on Applicant's disclosure—certainly an unacceptable procedure. An unsuccessful attempt to find in the cited references a motivation to "selectively directing a stream of liquid solder metal droplets in a first dimension and a second dimension" and "deflecting the electrically charged stream of liquid solder metal droplets in the first dimension and the second dimension" misses the point that is required to consider both the claimed invention and the cited references as a whole otherwise the required patentability standard is being applied incorrectly.

Watts teaches or suggests a jet soldering system including a solder ejector 12 for providing a continuous stream of charged solder droplets 14, deflecting plates 16, 18 for passing the charged solder droplets through to a gutter 20 or deflecting the droplets towards a substrate and an x-y translation table on which the substrate is mounted (Fig. 1, col. 3, lines 43-48 and col. 4, lines 17-21). The ejector 12 includes heaters 32, 34 to melt solder in a cartridge 77 contained therein, a gas pressure line 44 for pressurizing the molten solder and a piezoelectric vibrator 31 to produce a standing wave in the stream of solder leaving the ejector (col. 3, line 54 - col. 4, line 5).

Regarding presently amended independent claim 1 of the present application, Applicant respectfully submits there in no suggestion or motivation in the cited reference or from the knowledge generally available in the prior art which would lead one of ordinary skill in the art to modify Watts as suggested in the Office Action to establish a *prima facie* case of obviousness under 35 U.S.C. § 103 with respect to the presently claimed invention. As acknowledged by the Office, (Final Office Action, page 3, lines 9-10), Watts fails to disclose the limitations set forth in

claim 1 calling for "selectively directing said stream of liquid solder metal droplets in a first dimension and a second dimension" and "deflecting said electrically charged stream of liquid solder metal droplets in said first dimension and said second dimension". It was asserted in the Final Office Action that one of ordinary skill in the art would have been motivated to deflect the solder droplets of Watts in two dimensions as opposed to only one because the need for substrate movement would be eliminated and droplet placement would be more easily and accurately controlled. Applicant respectfully disagrees.

The Supreme Court has established the standard of patentability to be applied in obviousness rejections in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966). This standard has been summarized in MPEP §2141 into four factual inquires including "(A) determining of the scope and contents of the prior art; (B) ascertaining the differences between the prior art and the claims in issue; (C) resolving the level of ordinary skill in the pertinent art; and (D) evaluating evidence of secondary considerations." When applying such standard, the basic considerations which apply to obviousness rejections based on 35 U.S.C. § 103 should include the following principles of patent law: "(A) the claimed invention must be considered as a whole; (B) the references must be considered as a whole and must suggest the desirability and thus the obviousness of making the combination; (C) the references must be viewed without the benefit of impermissible hindsight vision afforded by the claimed invention; and (D) reasonable expectation of success is the standard with which obviousness is determined." *Hodosh v. Block Drug Co., Inc.*, 786 F.2d 1136, 1143 n.5, 229 USPQ 182, 187 n.5 (Fed. Cir. 1986). In establishing the differences between the prior art and a claimed invention "the question under 35 U.S.C. § 103 is not whether the differences themselves would have been obvious, but whether the claimed invention as a whole would have been obvious." *Stratoflex, Inc. v. Aeroquip Corp.*, 713 F.2d 1530, 218 USPQ 871 (Fed. Cir. 1983); *Schenck v. Nortron Corp.*, 713 F.2d 782, 218 USPQ 698 (Fed. Cir. 1983). Similarly, distilling an invention down to the "gist" or "thrust" of an invention disregards the requirement of analyzing the subject matter "as a whole." *W.L. Gore & Associates, Inc. v. Garlock, Inc.*, 721 F.2d 1540, 220 USPQ 303 (Fed. Cir. 1983), *cert. denied*, 469 U.S. 851 (1984).

First, there is no suggestion in Watts to support the conclusion that one of ordinary skill in the art would have been motivated to deflect the solder droplets in two dimensions as opposed to only one because the need for substrate movement would be eliminated and droplet placement would be more easily and accurately controlled. This conclusion and no other evidence have been presented to indicate it would have been obvious *at the time of the invention* to make the modification. "The mere fact that the prior art may be modified in the manner suggested by the Examiner does not make the modification obvious unless the prior art suggested the desirability of the modification. *In re Gordon*, 733 F.2d at 902, 221 USPQ (Fed. Cir. 1984). Rather, Applicant submits the reasoning for such modification as suggested in the Final Office Action appears to be drawn directly from Applicant's instant disclosure and is impermissible hindsight. See M.P.E.P. 2141.01(III). The Federal Circuit has repeatedly cautioned against employing hindsight by using the applicant's disclosure as a blueprint to reconstruct the claimed invention out of isolated teaching of the prior art. See, e.g., *Grain Processing Corp. v. American-Maize Prods. Co.*, 5 U.S.P.Q.2d 1788, 1792 (Fed. Cir. 1988).

Secondly, there is no reasonable expectation that this modification would be successful to establish a *prima facie* case of obviousness under 35 U.S.C. § 103 regarding the claimed invention. As previously discussed, Watts uses deflecting plates 16, 18 for passing the charged solder droplets through to gutter 20 or deflecting the droplets towards the substrate. In other words, solder droplets are ejected at a point directly above the gutter 20 and must be deflected along the Y axis toward the substrate (Fig. 1 and col. 4, lines 24-27). If the substrate movement capabilities were eliminated as suggested in the Office Action, any locations on the substrate residing below the gutter 20 would be blocked from the solder droplets. Accordingly, the system of Watts would be severely limited or inoperable in solder droplet depositing area, or would require major structural changes to gutter 20 that are not contemplated by the reference.

Applicant respectfully submits that, based on differences between the prior art cited and presently amended independent claim 1 and the fact that the prior art reference and claim 1 are not being considered as a whole, a *prima facie* case of obviousness has not been made; however, this conclusion is further substantiated if one also considers evaluation of secondary considerations. For example, considering the fact that the work piece and translation

mechanisms are several orders of magnitude heavier than a micron-sized droplet, positioning the droplets at the target is done much more quickly and requires much less energy in the present invention (because only the droplets are moved in the desired two dimensions) as compared to Watts (because some sort of the translation of the work piece is required). Additionally, such a broad statement by the Examiner that one skilled in the art would recognize, from the teaching of Watts, that addition of two more deflection plates would be obvious seems to negate the basic statutory requirement for one to obtain a patent of 35 U.S.C. § 101, i.e., "whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title (emphasis added)."

In reply to Applicant's argument that Watts would be practically inoperable with the modification suggested by the Office, it is stated that "as the substrate in Watts is moved in the X direction, the area below the gutter is refreshed with a new area of substrate that is also incapable of receiving a solder bump. To use the modification of deflecting in the X direction as well, as suggested in the Office Action, it is possible to deposit solder in areas above and below the gutter (in the X-direction)" (Final Office Action, page 6, lines 8-19). Applicant respectfully submits that, based on the Office's reasoning, there is no need for deflecting the droplets in two dimensions as recited in the present invention of claim 1. By moving the substrate in the X direction, neglecting *arguendo* Applicant's position of inoperability, one would not need plates to deflect the droplets in two dimensions. One dimensional deflecting capability (e.g., in the X direction) combined with motion of the substrate in the other direction, i.e., in the Y direction, would suffice to cover a two dimension surface. That being the case, Applicant would still respectfully argue that the proposed invention obtained by modifying Watts by use of hindsight based on Applicants' disclosure would still not teach or disclose all of the limitations of the presently recited invention of claim 1 to establish a prima facie case of obviousness under 35 U.S.C. § 103 regarding the presently claimed invention.

Applicant respectfully submits the rejection of claim 1 fails to establish the requisite motivation or expectation of success to establish a *prima facie* case of obviousness under 35 U.S.C. § 103. Accordingly, claim 1 is therefore allowable under the provisions of 35 U.S.C. §

103(a). Claims 2, 3, and 6 through 9, in depending from claim 1, are also allowable. If an independent claim is nonobvious under 35 U.S.C. 103, then any claim depending therefrom is nonobvious. *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988).

Applicants further submit that Watts fails to teach or suggest all of the claim limitations of presently amended dependent claim 2 to establish a *prima facie* case of obviousness under 35 U.S.C. § 103 regarding the presently claimed invention. Claim 2 recites the limitation of "controlling a temperature of the liquid solder metal in the reservoir for providing said stream of liquid solder metal droplets in said liquid state while selectively directing said stream of liquid solder metal droplets". Watts on the other hand, is limited to heaters 32, 34 which only melt solder within cartridge 77 and do not control the temperature of the stream of solder droplets once they are released from ejector 12.

Applicant respectfully submits that the Office is confusing the function of a temperature controller with that of a heater. A heater simply transfers heat to an object being heated. A temperature controller, which most of the time works in conjunction with a heater, controls the heat transfer process in order to assure that sufficient heat will be transferred to the object being heated in order to attain a final desired temperature. The Office's incorrect reading of Watts may be rooted in a confusion between the thermodynamic quantities of heat and temperature. See for example the Office statement that "the supply chamber act to control the heat of the solder when it is ejected." Applicant respectfully notes that heat is a transient thermodynamic phenomenon and, for that reason, one should not expect that objects, such as droplets, would have heat. Heat is transferred to or from an object and, as a result, the temperature of that object either rises or falls. The temperature of an object, in the other hand, is a thermodynamic property that measures the level of the different forms of energy stored therein. Temperature is affected by heat transfer, but it is not heat. For this reason, Applicants respectfully submit that the fact that Watts "teaches that the solder is heated to a desired temperature in the supply chamber," Final Office Action, page 7, lines 3-4, does not necessarily read on controlling the temperature of the ejected solder.

Therefore, for the reasons just explained, Applicant respectfully submits that Watts does not establish a *prima facie* case of obviousness under 35 U.S.C. § 103 of claims 1 through 3 and 6 through 9. Therefore, such claims are allowable.

**(C) Rejections under 35 U.S.C. § 103 of Watts combined with Nakasu.**

Claims 4 and 5 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Watts as applied to claim 3 above, and further in view of Nakasu.

Nakasu discloses a bump forming apparatus that comprises a first tank 3 storing fused solder 1 having an outlet 2 for the fused solder 1 on its bottom surface, a pipe 4 having one end connected with the outlet 2, a cavity 6, arranged below the first tank 3, having an inlet 5 for the fused solder 1 connected with another end of the pipe 4, a nozzle 8, arranged on a lower portion of the cavity 6, having a first opening 7 on its bottom surface, a pressure element formed by a diaphragm 9 arranged on an upper portion of the cavity 6 and a piezoelectric element 10 fixed to an upper surface of the diaphragm 9 for properly pressurizing the fused solder 1 in the cavity 6 toward the first opening 7 by external voltage application thereby dropping the fused solder 1 from the first opening 7 (Nakasu, col. 7, lines 36-54). In use, voltage is externally applied to the piezoelectric element 10 for expanding the piezoelectric element 10 thereby displacing the diaphragm 9 toward the first opening 7 and dropping the fused solder 1 from the first opening 7 by the pressure. When the fused solder 1 is dropped from the first opening 7, the surface level of the fused solder 1 in the first tank 3 so lowers that the fused solder 1 loses contact with the level detector 16. Then, the level control part 17 detects this and drives the second heater 15 for supplementing the fused solder 1 in the first tank 3. Thus, the surface level of the fused solder 1 in the first tank 3 is kept at a constant level.

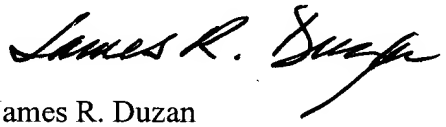
Applicant respectfully submits that Watts and Nakasu do not support a finding of obviousness of claims 4 and 5. Claims 4 and 5 are dependent from claim 3, which in turn is dependent from claim 1. Thus claims 4 and 5 include by dependency all of the limitations of claims 3 and 1. As explained hereinabove, Watts does not make obvious the invention recited in claim 1. Nakasu does not add any teaching or suggestion which would overcome the deficiencies of Watts in regard to the claim 1 limitations of "selectively directing said stream of liquid solder metal droplets in a first dimension and a second dimension" and "deflecting said electrically charged stream of liquid solder metal droplets in said first dimension and said second dimension." Therefore, the combination of Watts and Nakasu does not make obvious the

invention recited in claim 1. Claims 4 and 5 are therefore allowed, at least in part, for its dependency from claim 1. Applicant respectfully requests the allowance of claims 4 and 5 under 35 U.S.C. §103.

## CONCLUSION

Claims 1 through 9 are believed to be in condition for allowance, and an early notice thereof is respectfully requested. Should the Examiner determine that additional issues remain which might be resolved by a telephone conference, he is respectfully invited to contact Applicants' undersigned attorney.

Respectfully submitted,



James R. Duzan
Registration No. 28,393
Attorney for Applicant
TRASKBRITT
P.O. Box 2550
Salt Lake City, Utah 84110-2550
Telephone: 801-532-1922

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JRD/sls:djp

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